

Notes.

THE New Year Honours Lists which were issued at the end of last week include five barons, five Privy Councillors, twenty-one baronets, sixty-nine knights, and two Companions of Honour. Among the honours we note in particular the following conferred upon men whose names are known in scientific fields:—*Privy Councillor*: The Rev. Dr. Thomas Hamilton, for service to the cause of education in Ireland, first as President of Queen's College, Belfast, and afterwards as President and Vice-Chancellor of the Queen's University of Belfast. *Knights*: Prof. P. R. Scott Lang, for more than forty years Regius professor of mathematics in the University of St. Andrews; Mr. P. J. Michelli, secretary to the London School of Tropical Medicine; Dr. S. S. Sprigge, editor of the *Lancet*; Prof. James Walker, professor of chemistry, University of Edinburgh; and Dr. Dawson Williams, editor of the *British Medical Journal*. *C.M.G.*: Mr. I. B. Pole Evans, chief of the division of botany and plant pathology, Department of Agriculture, Union of South Africa. *C.I.E.*: Lt.-Col. W. F. Harvey, director of the Central Research Institute, Kasauli, Punjab, and Dr. E. J. Butler, formerly Imperial Mycologist, Pusa. *K.C.V.O.*: Dr. F. S. Hewett.

THE appeal for help to the scientific and literary community of Russia which we publish elsewhere should meet with a sympathetic response. Since the calamitous political disturbances began in their country many Russian scientific men have taken every opportunity of begging their colleagues and friends in the rest of Europe to help them to emigrate to more congenial surroundings abroad. In very few cases has it been possible to grant their petition. Now that the Bolshevik Government seems to have begun to realise that intellectual life has some value for the nation, it may be best that we should encourage our fellow-workers in Russia to remain at home and give them all possible assistance in promoting learning in the sad circumstances in which they find themselves. We understand that the great libraries, the university laboratories, and the old national collections, at least in Petersburg, are still intact, and that some provision has been made for the small remnant of Russians who are capable of using them. They merely need the stimulus of contact with the centres of intellectual work in other countries and an up-to-date knowledge of the results of research elsewhere. We trust that Britain will take the lead in furnishing this stimulus and supplying the necessary publications to enable Russia again to take a conspicuous place in the world of science, literature, and art.

THE Rockefeller Foundation has presented to the State of Louisiana a tract of country comprising some 35,000 acres known as the Grand Chenier Wild Life Refuge (*Science*, December 3). The land was purchased by the Foundation from individual holders in 1914 in order to preserve the wild life of the country, and it is a condition of the gift, which includes laboratories, publications, and equipment connected with the preservation enterprise, that the tract shall remain as a perpetual wild-life preserve.

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It is announced that Mr. Llewellyn Treacher has been selected for the Foulerton award of the Geologists' Association.

THE Aldred lecture will be delivered at the Royal Society of Arts on Wednesday, January 12, at 8 p.m., by Dr. C. S. Myers, director of the psychological laboratory, and lecturer in experimental psychology, University of Cambridge. The subject will be "Industrial Fatigue." Mr. W. L. Hichens will be in the chair.

Science of December 10 announces that the Elisha Kent Kane gold medal of the American Geographical Society has been conferred on Dr. A. Hamilton Rice in recognition of his pioneer exploratory work in South America; also that the Franklin Institute has awarded the Elliott Cresson gold medal to Dr. W. L. R. Emmet in recognition of his notable contributions to the art of ship propulsion.

DR. E. O. TEALE has been appointed Government Geologist of Tanganyika Colony, formerly German East Africa. Dr. Teale has already had much experience of African geology, having spent several years in Portuguese East Africa, and having been occupied more recently with geological work in Nigeria and Gold Coast Colony. With his former colleague Mr. Wilson he contributed an important paper on Portuguese East Africa to the *Geographical Journal*.

At the exhibition of paintings by the Birmingham Art Circle in the galleries of the Birmingham Royal Society of Artists there will be on view until January 20 two portraits (by Mr. Bernard Munns) which will be of interest to many readers of *NATURE*. One is that of the late Prof. John Henry Poynting, an admirable likeness in which the character of the subject is beautifully expressed. This portrait has been painted for the Trustees of the Poynting Memorial Fund, and will be hung in the guest hall of the University at Edgbaston. The other is a fine portrait of the late Prof. Adrian J. Brown, F.R.S. The University already has portraits by the same artist of the late Prof. Charles Lapworth and Prof. P. F. Frankland.

THE results of the balloting in the reorganisation of the International Commission on Zoological Nomenclature have been announced as follows:—*Class of 1922 (elected in 1913)*: Dr. J. A. Allen, New York, N.Y.; Dr. F. A. Bather, London; M. Ph. Dautzenberg, Paris; Dr. W. E. Hoyle, Cardiff; Dr. K. Jordan, Tring; and Prof. H. Kolbe, Berlin. *Class of 1925 (newly elected, vice Class of 1916)*: Dr. D. S. Jordan, Palo Alto, Cal.; Prof. A. Handlirsch, Vienna; Prof. R. Monticelli, Naples; Dr. E. Simon, Paris; Dr. H. Skinner, Phil., Pa.; and Dr. L. Stejneger, Washington, D.C. *Class of 1928 (newly elected, vice Class of 1919)*: Prof. C. Apstein, Berlin; Dr. E. J. O. Hartert, Tring; Dr. Geza Horvath, Budapest; Prof. Louis Roule, Paris; and Dr. C. W. Stiles, Washington, D.C. No majority was obtained for the vacancies caused by the death of Prof. Blanchard and by the resignation of Prof. Roule; accordingly a new vote is

being taken. Each class consists of six Commissioners elected to serve nine years, and selected from the zoological profession of the world at large.

At the annual general meeting of the Faraday Society held on December 13, the following officers and council were elected to serve for the coming year:—*President*: Prof. A. W. Porter. *Past-Presidents*: J. Swinburne, Sir Richard Glazebrook, and Sir Robert Hadfield, Bart. *Vice-Presidents*: W. R. Cooper, Prof. C. H. Desch, Dr. J. A. Harker, Emil Hatschek, Prof. T. M. Lowry, Dr. E. H. Rayner, and Dr. G. Senter. *Treasurer*: Robert L. Mond. *Council*: Dr. A. J. Allmand, Dr. H. Borns, Prof. W. C. McC. Lewis, Harold Moore, Prof. J. R. Partington, C. C. Paterson, Prof. A. O. Rankine, Sir Robert Robertson, Sir T. Kirke Rose, and Dr. W. Rosenhain. Prof. Porter, in proposing a vote of thanks to the retiring president, Sir Robert Hadfield, who had guided the society during the whole critical period of the war, referred to the growth that had taken place in the society's work and in its prestige during that period. He remarked that of the twenty-six general discussions that had been organised by the society, many of them in co-operation with other societies the collaboration of which was greatly appreciated, as many as nineteen had been held during Sir Robert Hadfield's presidency.

THE Report of the Watchers' Committee of the Royal Society for the Protection of Birds for the years 1919-20 is a record of excellent results obtained, but it also reveals how much remains to be accomplished, and could be accomplished if the necessary funds for the purpose were forthcoming. Those at its disposal are wholly inadequate to meet even the expenses already incurred. The society employs twenty-three watchers who are located at seventeen breeding stations annually resorted to by some of the rarer, and hence much persecuted, British birds. Thanks to the loyalty and devotion of these excellent men—they are offered bribes and subjected to threats—it is gratifying to learn that nests of the bittern, Kentish plover, red-necked phalarope, cough, whimbrel, and many other species, including in the south of England the raven and the peregrine, were successfully protected. On the other hand, owing to lack of funds to provide for adequate watching, a lamentable state of affairs is revealed. Thus roseate and Sandwich terns were robbed of all their eggs, and divers, the numbers of which are annually growing fewer, were sadly raided, so that in one case of thirteen nests only three young birds were hatched, while in another out of fifteen nests eight were destroyed. The craze for egg-collecting at the present time is, unfortunately, at its zenith, the excuse being that the specimens are taken for scientific purposes. If scientific results may be derived from the study of the eggs of British birds, it may be safely averred that there is already a plethora of material available for the purpose. It is greatly to be hoped that bird-lovers who are not subscribers to the Watchers' Committee will respond to the society's earnest appeal and help to carry on this highly desirable, patriotic work. The society's address is 23 Queen Anne's Gate, S.W.1.

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In a study of variation in the mealworm, *Tenebrio molitor*, Mr. S. A. Arendsen Hein finds two common colour varieties of the larvæ, chestnut-brown and orange-red, and a rare melanic type with black instead of reddish-brown abdomen, antennæ, and legs. Red and yellow eye-colours are inherited, and the latter is sex-linked. Reduction in the number of tarsal and antennal segments is also based on hereditary factors. The duration of the larval stage is largely controlled by temperature. Females usually produce no eggs without previous mating, and egg-production normally continues for two months.

WE have received vol. vii., part 4 (Series C, Zoology and Botany), of the Scientific Reports of the Australasian Antarctic Expedition, 1911-14, containing the bacteriological and other researches dealing with physiology, dietetics, psychology, etc., by Dr. A. L. McLean. Cultivations from the intestinal tract of some of the mammals and birds (e.g. Ross seal and penguins) contain no, or very few, bacteria. Similar results have been obtained in the case of Arctic forms by Levin and others. In other mammals and birds (e.g. Weddell seal, sea-leopard, and skua gull) the bacterial content of the intestine was high, containing coliform organisms and sporing bacilli. Cultures of bacteria were obtained from ice, snow, soils, and marine mud. Suppuration was observed in the wounds of Weddell seals, inflicted by the sea-leopard and killer whales, with a bacterial flora of streptococci and staphylococci. Observations on the hæmoglobin values of the blood and on blood-pressure showed little of interest. It was noticeable that the hair of the head and the nails grew very slowly.

VOL. XLIII., article 6, of the Bulletin of the American Museum of Natural History (issued on December 4) consists of an extensive paper on the Lepidoptera of the Congo by Dr. W. J. Holland. It takes the form of a systematic list of the species of that order of insects collected during the expedition sent out by the museum to the Congo region. Although the collection is one of the largest made in recent years in that part of the world, it is very poor in moths, most attention being devoted to the showier Nymphaline and other butterflies. As Dr. Holland points out, the primary aim was to secure vertebrates, and the making of insect collections was a subsidiary object. From among about 9000 specimens there are more than 725 species and varieties. It has only been found necessary to erect two new genera, and the new species and varieties amount to fewer than 80. The largest number of specimens was secured at Medje, near the Nepoko River, in the heart of the forest, from April to September, 1910, and the collection as a whole exhibits a distinct affinity with the West African fauna. The paper is evidently an important contribution to our knowledge of the distribution of Lepidoptera in Africa, and is illustrated by nine three-colour-process plates and a similar number of text figures.

AMONG the creatures that live harmoniously with termites in their nests is a Staphylinid beetle, which, like the familiar "devil's coach-horse," turns its abdomen over its back, but in this case the abdomen

is greatly swollen, stretches far forward, and is extended backwards only with difficulty. This beetle, previously referred by Dr. E. Warren to the South American genus *Corotoca*, has now been more closely investigated by him, and is redescribed as *Paracorotoca akermani* (Ann. Natal Mus., vol. iv., pp. 297-366, pls. xvi-xxi, November, 1920). Dr. Warren finds that, structurally, it is closer to the Malayan *Termitoptochus*, and infers that the resemblances to *Corotoca* and other termitophilous beetles are due to the similarity of their environment. *Paracorotoca* has been found only in nests of the common *Eutermes* (*E. trinerviiformis*) of Natal, and is very rare. The inflated abdomen is almost filled with the greatly overgrown sexual organs. The ova are relatively huge, and this is probably connected with the viviparous production of large larvæ. No similar need exists for the large size of the male organs, and it may be supposed that the stimulus for their growth has been transmitted to the male from the female. How far the termites feed the beetles and in what way the beetles repay the hospitality are questions not yet settled. One curious observation has been made: when termites are alarmed they vibrate their bodies in a characteristic manner, and the beetle does the same. Dr. Warren compares the habit in the termites to the trembling with rage or fear in mammals, and suggests that the intimate association of the beetle with the termites has produced in it a similar nerve-tone.

THE *Journal of the Ministry of Agriculture* for October and November, 1920, contains an interesting account of the work of the new Plant Breeding Institution at Aberystwyth by the director, Prof. R. G. Stapledon. In addition to the laboratories, which are now completed, there is a drying-room and a gardeners' room designed for the threshing and cleaning of small lots of seeds. The land attached to the station includes 4 acres of garden-ground, a 13-acre field of arable land for larger trials, and an adjoining farm of 92 acres. One of the chief problems taken up is that of the improvement of herbage plants for the grassland areas of Wales and the West of England. Of the numerous grasses and legumes being tried the following already show promise: *Phalaris nodosa*, a rich pasture grass from South Africa; *Dianthionia pilosa*, from New Zealand; *Eragrostis abyssinica*, which produces hay in portions of Natal and the Transvaal; *Trifolium subterraneum*; and the hairy vetch, *Vicia villosa*. Local indigenous grasses are also being brought into cultivation with the view of improving strains which are already adapted to the conditions. Cocksfoot grass from various countries was grown, and the indigenous plants were found to show greater development and to have the advantage of being later. Experiments are also being taken up with cereals, particularly oats, for high elevations and high rainfall.

THE possibility of recognising shoals and channels from a photographic print and of determining in some measure the shape of submerged land-forms opens a new avenue of approach to the study of submarine geography by the use of aerial photography.

The subject is discussed by Dr. W. T. Lee in an article in the *Geographical Review* for November (vol. x., No. 5). A number of finely reproduced photographs by the Air Service of the United States Army illustrate the extent to which the camera succeeds in recording submarine features. Experience seems to show that the best results are likely to be obtained early in the morning or late in the afternoon under an evenly illuminated sky. Either an entirely overcast or a uniformly clear sky is more favourable than a partly clouded sky. Waves appear to have little effect on the visibility of submarine relief, but by the diffusion of reflected light they can at times destroy the effect of the detail on the photographic plate. More research, however, is necessary in order to decide the best conditions for determining clear detail.

THE recurrent subject of the growth of flint is revived by Mr. C. Carus-Wilson in a letter to the *Geological Magazine* for October, where a case is quoted of the inclusion in flint of wood bored by *Teredo*. The problems that this specimen justly raise in Mr. Carus-Wilson's mind could probably be set at rest, as in other cases referred to, by thin sections cut from the encasing flint, and it is to be hoped that the matter will be pursued further.

MR. S. S. BUCKMAN'S work on "Type Ammonites," finely illustrated by photographs of actual specimens, has reached its twenty-third part, and is already a monument to the painstaking devotion of its author. We fear that questions from other workers as to generic subtleties must make serious inroads on Mr. Buckman's time, since we cannot now think of British ammonites without him. The work is published for the author by Messrs. W. Wesley and Son, Essex Street, London, W.C.2.

TABLES of frequencies of surface-wind directions and cloud amounts at Metz, Mulhausen, Karlsruhe, and Frankfort by Capt. D. Brunt have been published by the Meteorological Office as Professional Notes No. 14. The tables are similar to those given previously for Richmond and Greenwich. They are based on the observations from the German Daily Weather Reports for ten years, 1900-10, excluding 1906. The results are said to differ widely from those for Richmond, where the number of clear skies in the summer is much greater in the evening than in the morning, but the tables in the present publication show only a very slight clearing in the evening in the summer, and in July the evenings are cloudier than the mornings. For the towns dealt with, the most frequent wind directions are north-east and south-west. North-east winds divide into two groups, with clear and overcast skies respectively, and in the summer they give more clear skies in the evening than in the morning, the cloudiness of the weather being apparently controlled by the different weather types. South-west and west winds are said usually to be associated with the passage of depressions across the British Isles, tending to give overcast skies, especially during the morning. They are associated with a greater frequency of clear skies in the evening during the months of September and October. Pilot-balloon results show that at Aix-la-Chapelle

(Aachen) and Frankfort the direction of the wind at the surface is practically the same as at an elevation of 1000 metres, while at Strasbourg the wind at the surface is usually backed two points from the wind at 1000 metres.

WHEN the interpretation of crystal structure on the basis of close-packed spheres was put forward by Barlow and Pope in 1906 it was suggested that the sphere of influence of each atom in a given crystal was approximately proportional to its valency, but that these spheres of influence varied in size in a series of isomorphous crystals in such a way as to preserve the proportionality of their individual volumes to the valencies, whilst the sum of their volumes varied with the molecular volume of the compound. Prof. W. L. Bragg's study of the structure of crystals by means of X-ray analysis, on the other hand, led to the conclusion that each atom has a constant sphere of influence, the atomic diameters of some of the common elements being, for instance, as follows:

F = 1.35 Å.	O = 1.30 Å.	Li = 1.50 Å.	Be = 1.15 Å.
Cl = 2.10	S = 2.05	Na = 1.77	Mg = 1.42
Br = 2.38	Se = 2.35	K = 2.07	Ca = 1.70
I = 2.80	Te = 2.66	Rb = 2.25	Sr = 1.95
		Cs = 2.37	Ba = 2.10

A crucial test of these alternative views can be made most readily by carrying out an X-ray examination of an isomorphous series, and this has now been done in the case of calcite and the isomorphous carbonates of manganese and iron, the Laue patterns from which have been analysed by a novel geometric method by R. W. G. Wyckoff (*American Journal of Science* [iv], vol. 1., pp. 317-60, November, 1920). The following results were obtained:

	CaCO ₃	MnCO ₃ (and FeCO ₃)
Distance from carbon to oxygen	1.21 (1.42)	1.22 (1.42)
" " " metal	3.04 (2.47)	2.83 (2.24 and 2.17)
" " oxygen	2.30 (2.35)	1.96 (2.12 " 2.05)

In this table the distances from carbon to oxygen are constant, whilst the distances from carbon to metal and from oxygen to metal are about 0.26 Å. and 0.34 Å. greater for calcium than for manganese and iron. It should, however, be noted that most of these data differ considerably from those given by Bragg (which are shown in brackets in the table), the deviations rising to 0.6 Å. in the distance from carbon to metal, *i.e.* nearly three times as much as the variation on passing from calcium to manganese or iron.

In *Science* for October 15 Mr. J. J. Willaman, of the University of Minnesota, directs attention to the possibility of utilising artichoke and dahlia tubers as sources of fructose, which could be used, in place of ordinary sugar (sucrose), as a sweetening agent. These tubers contain the carbohydrate inulin, which on hydrolysis by acids is converted into fructose (lævulose), just as starch is similarly convertible into glucose (dextrose). Taking an average crop of artichoke tubers at 40,000 lb. per acre, and assuming a recovery of 10 per cent. of inulin, Mr. Willaman states that it should be possible to obtain about 4000 lb. of fructose per acre, which is nearly equal to the yield of sucrose from a good crop

of sugar-cane and about twice the yield of glucose syrup from an average crop of maize; fructose, moreover, is sweeter than either sucrose or glucose, so that artichokes would appear to have a distinct advantage over either sugar-cane or maize as a source of sweetening material. The author realises that the matter may not be quite so simple as it looks, and he appeals for the inauguration of research by some official or industrial organisation to ascertain whether a presentable fructose can be made from artichokes. These tubers have been used in Germany as a source of alcohol, but that is a simpler proposition than the manufacture from them of a serious competitor with cane-sugar. Artichokes grow well in England, as hundreds of allotment-holders discovered during the war; there are plenty of British chemists familiar with the chemistry of carbohydrates, and our large consumption of sugar is met almost entirely by imports. In view of this, the Department of Scientific and Industrial Research might do worse than take Mr. Willaman's suggestion into serious consideration, if it has not already done so, and, if there is anything in it, arrange to have the necessary research work done in this country.

WE have received a Physical Department Paper issued by the Egyptian Ministry of Public Works on "The Effect of Turbulence on River-discharge Measurements," forming an addendum to a Report on Nile Gauge Readings and Discharges published in March last. Mr. Hurst, Controller of the Physical Department, has prepared this note to prevent any misconception which might arise on the statement of certain views attributed to Mr. Craig, of the Egyptian Survey, in the earlier publication. The Survey of Egypt carried out a long series of river-discharge measurements at Sarras, in the Sudan, the results of which, after making all necessary allowances, showed a considerable divergence from the readings at the Aswân Dam, amounting to about 15 per cent. In 1912 Mr. Craig put forward the suggestion that the variation might be due to the effect of turbulence in the flow, and showed mathematically that reductions in apparent volume might have to be made amounting to as much as 20 per cent. during flood and to 10 or 15 per cent. when the river was low. Experimental investigation, however, has demonstrated that the correction for turbulence at the low stage of the river is negligible. After alluding to some further experiments now being carried on, the paper concludes:—"The effect of turbulence at the low stage is now settled, and the probability is that the amount of turbulence present in the Nile in flood at well-chosen sites will not necessitate any corrections of practical importance. The cause of the difference between the discharges at Sarras and Aswân still remains to be found."

WE have received from Messrs. J. Woolley, Sons and Co., Ltd., of Manchester, a copy of their "Scientists' Reference Book and Diary," price 3s. 6d. The book contains much interesting and useful information in addition to that usually found in diaries. The first section deals with the physical sciences, and contains a short article on recent advances in physics; another portion is devoted to chemical tables and

includes convenient data relating to specific gravities, solubilities, strengths of solutions for analysis, etc. A section is also devoted to scientific societies and departments, in which a brief account is given showing the address and the officials of each. The diary is well bound, and makes a convenient pocket-book for ready reference and notes.

MESSRS. H. F. AND G. WITHERBY are about to publish vol. i. of "A Manual of the Birds of Australia,"

edited by G. M. Mathews and T. Iredale, illustrated by coloured and monochrome plates.

A NEW edition of Sir Edward Thorpe's "A Dictionary of Applied Chemistry" is announced by Messrs. Longmans and Co. Vol. i., A to Calcium, is promised for January, and vol. ii. for early in the coming summer. The work, which has been carefully revised, will be in six, and possibly seven, volumes.

Our Astronomical Column.

COMETS.—Mr. Woods has communicated by cable the following elements of Skjellerup's comet. Elements deduced by M. Ebell from observations on December 13, 17, and 18 last are also given. Both are for the equinox of 1920-0:

	Woods	Ebell
T in G.M.T. Dec. 11'11	Dec. 13'46	5'12
ω	341° 10'	344° 9' 47"
Ω	107 47	107 38 7
i	22 12	24 4 7
$\log q$	0.06047	0.06476

Mr. Woods's elements make the position at midnight on January 20: R.A. 11h. 7m. 17s., N. decl. $36^{\circ} 22'$. The position given last week was: R.A. 11h. 17m. 42s., N. decl. $38^{\circ} 24'$.

Herr Hoffmeister observed the comet at Sonneberg on December 18. He described it as a circular nebulosity 8.0' in diameter, total light 9th magnitude, nucleus 11th magnitude.

An observation by Mr. R. L. Waterfield on December 31 indicates that Mr. Woods's ephemeris is very near the truth.

The two longest-known comets of short period (those of Encke and Pons-Winnecke) are both due at perihelion in 1921. There is a simple method of predicting the date of perihelion of the former comet within a day or so. Eighteen revolutions of the comet occupy $50\frac{1}{2}$ years, equal approximately to five revolutions of Jupiter and two of Saturn, so that the perturbations nearly repeat themselves after this period. The following have been the duration of eighteen revolutions at recent returns:

Interval (days)	Interval (days)
1845 to 1905 21704.28	1855 to 1914 21705.75
1848 to 1908 21704.08	1858 to 1918 21705.92
1852 to 1911 21705.33	1862 to 1921 21706.1
	about

Perihelion should occur about July 13.4.

Winnecke's comet is subject to large perturbations by Jupiter, and no simple cycle is available in this case. The best estimate that can be made of the date of perihelion is the end of June, but this may be a month in error. The period of this comet has increased by four months in the last century, and the perihelion distance has increased from 0.77 to unity. This has resulted in introducing it into a new shower of meteors, first seen on June 28, 1916, the connection of which with Winnecke's comet was quickly detected by Mr. Denning. These meteors should be in evidence next June. The radiant is about $240^{\circ} + 50^{\circ}$.

Another periodic comet may return this year, 1846 IV (de Vico). The most probable period is 75.7 years, which would make the next perihelion November, 1921, but the uncertainty is fully three years. The comet will first become visible to southern

observers, but it will move northward very rapidly, its inclination to the ecliptic being 85° .

DISAPPEARANCE OF SATURN'S RINGS.—The earth passed through the plane of the rings on November 7, and a joint paper on the phenomena presented about that date, by Messrs. Hepburn, Ainslie, Steavenson, and Waterfield, was read at the R.A.S. meeting on December 10. They observed with the 28-in. equatorial at Greenwich, by kind permission of the Astronomer-Royal. On November 6 the ring was easily visible, but on the following night no trace whatever was visible outside the ball. This was confirmed by Prof. Barnard, observing with the 40-in. at Yerkes Observatory, who estimated that the thickness of the rings could scarcely exceed 40 miles. A few days later, in spite of the dark side of the rings being turned towards us, the observers at Greenwich could clearly see a number of luminous patches outside the ball, which they were able to identify with the brighter regions of the ring; they noticed that these regions continued visible when twilight was far advanced and long after the inner satellites had disappeared. This would appear to indicate that an appreciable amount of sunlight is able to penetrate the ring, illuminating the particles on its remote side. It will be remembered that a star was recently seen through the ring, so it is not surprising that sunshine should penetrate it.

The ring will again be edgewise to the earth on February 21 and August 2, and to the sun on April 10.

KODAIKANAL OBSERVATORY.—Bulletin lxiii. of this observatory deals with the direction and aspect of the dark filaments, which are such a conspicuous feature of spectroheliograms in $H\alpha$ light, and are known to be prominences projected on the solar disc. Their azimuth is first studied, and shown to be a function of latitude. Near the equator they lie along a meridian; as we recede from the equator the polar end of the filament swings eastward. The mean inclination to the equator is 40° in latitude 30° and 0° in latitude 60° .

The explanation suggested is the easterly drift produced by the excess of easterly motion at the equator. It was inferred from this that the high-latitude filaments are older than the equatorial ones. However, a study of the history of particular filaments from the photographic records did not give clear evidence of this difference of age with latitude.

Two interesting features of the prominences are discussed: (1) Those on the disc are flanked by a bright strip, which is easiest to see near the limb. It is interpreted as showing that the prominences rest on a bright base which is hotter than the ordinary chromosphere. (2) The lower portion of prominences seen in profile outside the disc is frequently obscured by a dark strip. It is suggested that the central region of a prominence is the hottest, and that the lower portions of the cooler outer envelope may be dense enough to absorb light.